PATENT SPECIFICATION

824,717

Date of Application and filing Complete Specification: October 14, 1957. *No. 31951/57*

Application made in Germany on November 15, 1956

Complete Specification Published: December 2, 1959

Index at Acceptance:—**Classes 99(1), G(2J:10A:18A:18B), GX; and 99(2), P1B(5D:7:8).**

International Classification:—F06l.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in Hollow Equipment with Corrosion-Resistant Linings

ERRATUM

SPECIFICATION NO. 824,717

Page 1, Index at Acceptance:- *for* "Classes 99(1) G(2J: 10A: 18A: 18B), GX: and 99(2) P1B(5D:7:8)." *read* "Classes 99(1) G(2J: 10A: 18A: 18B: 37): and 99(2) P1B(5D:7:8)."

THE PATENT OFFICE,
1st February, 1960

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suspensions, vapours, and gases, is often made of high grade allow steels, for example chromium steel containing 18% chromium and 8% nickel. For this reason it is extremely costly. It is with a view to reducing high grade steel requirements that proposals have been put forward to make use of compound sheets, for example consisting of a layer of ordinary carbon steel on to the inner side of which a non-corroding high grade steel is rolled. The manufacture of such hollow bodies is very uncommercial since it is very difficult to weld such compound metal sheets. They also tend to corrode at the welds and yet a substantial amount of high grade steel is still required.

In order to save high grade steel, it has more recently been proposed to use less costly materials, such as carbon steels, and to cover the side subject to the action of corrosives, i.e. the inside in the case of containers, with inorganic or organic plastics, such as synthetic baking enamel or self-setting plastics. Containers and vessels as well as pipes, fittings, and hollow apparatus in general can be effectively protected against the action of corrosives, provided that the hollow space is easily accessible.

[Price 3s. 6d.]

of solid substances, gases or vapours, mixtures, or suspensions, requiring to be manufactured by joining together several components (for example towers comprising several sections or pipe systems), in which very little high grade material is used, and to protect them against corrosion by lining them with plastics, preferably self-setting or thermo-setting or even thermoplastic synthetic resins, but to design them in such manner that the parts to be joined can be welded together.

According to the present invention, hollow equipment is formed of metal components having a corrosion-resistant plastic lining, which components terminate in sleeves of corrosion-resistant metal adapted to be connected end-to-end by a corrosion-resistant weld, the joints between the bodies of the components and the ends of the sleeves remote from the ends to be connected by welding being covered by the plastic linings of the components.

The corrosion-resistant sleeves may lie wholly inside the components, which themselves are adapted to be welded end-to-end, outside the weld to connect the sleeves end-to-end.

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DRAWINGS ATTACHED

Improvements in Hollow Equipment with Corrosion-Resistant Linings

I, HUBERT SALMEN, sole responsible partner of Saüreschutz Rheinruhr Ober-Ing. of 30, Tilsiter Strasse, Gladbeck, Westphalia, Germany, a citizen of the Federal Republic of Germany, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to hollow equipment, such as containers, piping, and apparatus, with corrosion-resistant linings.

Such equipment, as used for the treatment, transport, and storage of corrosive liquids, suspensions, vapours, and gases, is often made of high grade allow steels, for example chromium steel containing 18% chromium and 8% nickel. For this reason it is extremely costly. It is with a view to reducing high grade steel requirements that proposals have been put forward to make use of compound sheets, for example consisting of a layer of ordinary carbon steel on to the inner side of which a non-corroding high grade steel is rolled. The manufacture of such hollow bodies is very uncommercial since it is very difficult to weld such compound metal sheets. They also tend to corrode at the welds and yet a substantial amount of high grade steel is still required.

In order to save high grade steel, it has more recently been proposed to use less costly materials, such as carbon steels, and to cover the side subject to the action of corrosives, i.e. the inside in the case of containers, with inorganic or organic plastics, such as synthetic baking enamel or self-setting plastics. Containers and vessels as well as pipes, fittings, and hollow apparatus in general can be effectively protected against the action of corrosives, provided that the hollow space is easily accessible.

[Price 3s. 6d.]

The disadvantage of such lined hollow bodies is that they cannot be welded, since the plastic will not withstand the welding temperatures and is therefore destroyed at the weld.

Thus, for example, lengths of ordinary iron pipe lined on the inside with a plastic material cannot be welded together in order to provide pressure-tight pipe lines without flanges. Neither can parts of containers or apparatus that have been lined with plastics to be joined together by welding.

The object of this invention is to produce hollow metal bodies, such as containers, apparatus, or pipelines for corrosive liquid or solid substances, gases or vapours, mixtures, or suspensions, requiring to be manufactured by joining together several components (for example towers comprising several sections or pipe systems), in which very little high grade material is used, and to protect them against corrosion by lining them with plastics, preferably self-setting or thermo-setting or even thermoplastic synthetic resins, but to design them in such manner that the parts to be joined can be welded together.

According to the present invention, hollow equipment is formed of metal components having a corrosion-resistant plastic lining, which components terminate in sleeves of corrosion-resistant metal adapted to be connected end-to-end by a corrosion-resistant weld, the joints between the bodies of the components and the ends of the sleeves remote from the ends to be connected by welding being covered by the plastic linings of the components.

The corrosion-resistant sleeves may lie wholly inside the components, which themselves are adapted to be welded end-to-end, outside the weld to connect the sleeves end-to-end.

The components may also have external sleeves of corrosion-resistant material, to be welded end-to-end, together with external corrosion-resistant plastic coatings covering the joints between the bodies of the components and the ends of the external sleeves remote from the ends to be connected by welding.

Again, the corrosion-resistant sleeves may each be welded at one end to one component, these welded joints being covered by the plastic linings, and the components may also have external corrosion-resistant plastic coatings, covering the welded joints between the sleeves and the components.

In another construction, the sleeves are thickened at their ends to be welded together, and the ends of the sleeves remote from the ends to be welded together may be recessed into the inner sides of the components to provide a smooth surface at the joints covered by the plastic linings. Additionally, the ends of the sleeves to be welded may together form a spigot and a socket, so that the weld between them does not extend to the inner surface.

The invention also includes a process for the manufacture of hollow equipment formed of metal components having a corrosion-resistant plastic lining, which process comprises securing sleeves of corrosion-resistant metal to two components to be joined, causing the internal joints between the sleeves and the components to be covered by the plastic linings of the latter, and connecting the components by welding the sleeves end-to-end.

Sleeves of chromium-nickel steel, copper, nickel-copper alloys or other appropriately corrosion-resistant metal may be used. The overlapping of the joints between the sleeves and the components by plastic lining affords continuous protection for the base metal of the equipment.

The welded joints between the sleeves may be effected by means of welding rods made of the same type of corrosion-resistant metal If, as already indicated, the ends of the components themselves are welded together, welding metal similar to the base metal of the individual components can be used in the usual way for stressed welds or welds of the non-corroding metal as the sleeves may be employed, thus ensuring that all the welded seams of the sleeves and the stressed walls comprise a uniform, non-corroding material.

The joints between the sleeves and the components may be welded, or a corrosion-resisting brazing or soldering material may be used.

The length of the non-corroding metal sleeve may readily be selected such that, also having regard to the thickness of the sleeve, the welding heat does not damage the plastic material covering the joint between the sleeve and the component.

By means of the invention hollow containers, apparatus, pipelines, and other equipment, which because of technical reasons, inaccessibility, size, or any other reason have to be welded, can be porvided with a corrosion-resisting lining so that a lower grade material, for example ordinary carbon steel, can be used for the components, while at the same time maximum corrosion-resistance and/or resistance to wear can be obtained. In this way valuable high grade steel can be economised.

Inlet, outlet, and distributing pipes, and heating units, of such hollow equipment provided with a corrosion-resistant plastic coating, may be similarly connected by corrosion-resistant sleeves.

The invention will now be further described with reference to the accompanying drawings, in which

Figure 1 is a longitudinal section of a welded joint with an internal sleeve and a plastic lining;

Figure 2 is a corresponding view of a welded joint with non-projecting sleeves and a plastic lining on both sides;

Figure 3 shows a corresponding view of an arrangement of a welded joint with sleeves so designed that a perfectly flat surface is obtained on the corrosion-resistant side; and

Figure 4 is a section through a container with built-in distribution pipe.

The joint in Figure 1 is on a hollow body consisting of the main parts 1a and 1b, made of ordinary carbon steel and meeting at the joint 2 where they are butt-welded together. A corrosion-resisting joint is made at the butt joint by sleeves, 3a and 3b made of corrosion-resisting steel, e.g., steel sheet containing 18% chromium and 8% nickel, secured at one end to the parts 1a and 1b by welds 4, the sleeves being so shaped at the other end that they abut to receive a V-shaped seam 2. The root 2a, of the Vee seam, that is, in the region of the sleeves 3a and 3b, is of a corrosion-resisting substance, while above this a mechanically stressed welded joint 2 between the main parts 1a and 1b is made with a similar non-corroding welding material. On the outer side edges of the anti-corrosion sleeves 3a and 3b, that is on the edges furthest way from the weld, a plastic lining coating 5 is securely affixed to overlap, being sprayed on or produced by dipping. Both the width and the thickness of the sleeves 3a and 3b are selected so that the plastic lining 5 cannot be damaged by the welding process.

In Figure 2, sleeves 3a and 3b are butt-welded to the components 1a and 1b to be joined together. These sleeves are made of a corrosion-resisting metal, say pure copper, and are welded with the same metal at the join 2. The surfaces on both sides of the

structural parts 1a and 1b, which are subject to corrosion, are covered with a plastic layer 5, so that the latter extends beyond the butt weld 4 to overlap the sleeves 3a and 3b. The width and thickness of these sleeves is selected to ensure that, during the welding process, the plastic layer 5 is not adversely affected either by the welding heat or by conduction of heat from the weld.

In Figure 3, the free ends of the base metal parts 1a and 1b are thickened in order to increase the strength of the joint and are recessed for reception of sleeves 3a and 3b. The thin-walled shells of sleeves 3a and 3b, say of 60-70% nickel, 35-25% copper and about 5% iron, manganese silicon and carbon alloy, engage in these recesses. The ends of these sleeves are also recessed to take the overlapping plasic layer and the inside surface of the sleeves present a perfectly smooth surface. The sleeves are welded to the top of the base metal parts 1a and 1b by means of welds 4 and 4a, the weld 4a being ground down to the level of the recessed surface, and the non-corroding plastic layer 5 then being applied. The sleeves are provided with extra thickness and make a spigot-and-socket connection at the place where the weld is to be, so that the joining weld 2 does not extend to the inner surface, thus completely preventing any weld seam from protruding on the inside.

In Figure 4 a container consists of two halves 6a and 6b given a plastic lining say by spraying, and baking if necessary. The two halves 6a and 6b are joined together by the method as described with reference to Figure 1. Before the parts of the container are joined together, a distribution pipe 8—after having been provided inside and outside with a protecting covering of baking enamel—is joined to a connection piece 7 by means of the method described with reference to Figure 2, the joint being indicated at 9.

WHAT I CLAIM IS:—

1. Hollow equipment formed of metal components having a corrosion-resistant plastic lining, which components terminate in sleeves of corrosion-resistant metal adapted to be connected end-to-end by a corrosion-resistant weld, the joints betwen the bodies of the components and the ends of the sleeves remote from the ends to be connected by welding being covered by the plastic linings of the components.

2. Hollow equipment as in Claim 1, wherein the corrosion-resistant sleeves lie wholly inside the components, which themselves are adapted to be welded end-to-end, outside the weld to connect the sleeves end-to-end.

3. Hollow equipment as in Claim 2, wherein the components also have extenral sleeves of corrosion-resistant material, to be welded end-to-end, together with external corrosion-resistant plastic coatings covering the joints between the bodies of the components and the ends of the external sleeves remote from the ends to be connected by welding.

4. Hollow equipment as in Claim 1, wherein the corrosion resistant sleeves are each welded at one end to one component, these welded joints being covered by the plastic lining.

5. Hollow equipment as in Claim 4, where in the components also have external corrosion-resistant plastic coatings, covering the welded joints between the sleeves and the components.

6. Hollow equipment as in Claim 1, wherein the sleeves are thickened at their ends to be welded together.

7. Hollow equipment as in Claim 6, wherein the ends of the sleeves remote from the ends to be welded together are recessed into the inner sides of the components to provide a smooth surface at the joints covered by the plastic linings.

8. Hollow equipment as in Claim 6 or Claim 7, wherein the ends of the sleeves to be welded together form a spigot and a socket, so that the weld between them does not extend to the inner surface.

9. Hollow equipment formed of metal components having a corrosion-resistant plastic lining and corrosion-resistant metal sleeves adapted to be welded end-to-end, substantially as hereinbefore described with reference to the accompanying drawing.

10. A process for the manufacture of hollow equipment formed of metal components having a corrosion-resistant plastic lining, comprising securing sleeves of corrosion-resistant metal to two components to be joined, causing the internal joints between the sleeves and the components to be covered by the plastic linings of the latter, and connecting the components by welding the sleeves end-to-end.

11. A process for the manufacture of hollow equipment formed of metal components having a corrosion-resistant plastic lining substantially as hereinbefore described with reference to the accompanying drawing.

DATED THIS 11th DAY OF OCTOBER, 1957.

HULSE & CO.,
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269 Glossop Road,
Sheffield, 10.

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824,717 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig. 1

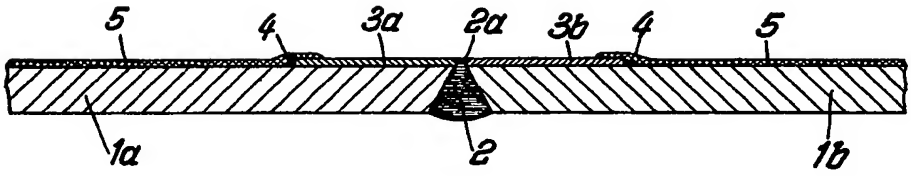

Fig. 2

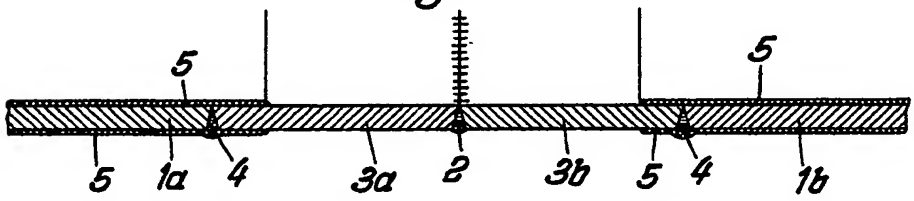

Fig. 3

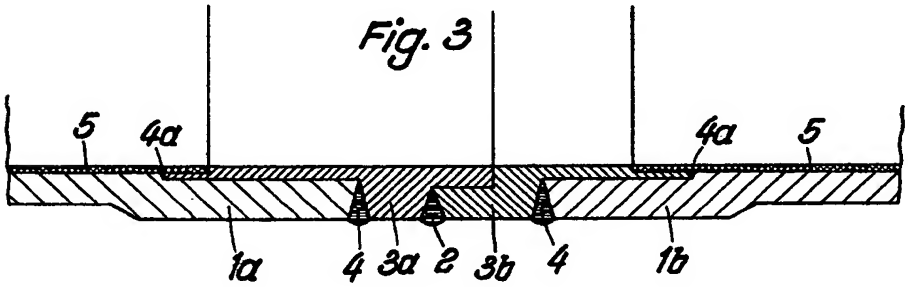

Fig. 4